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(54) **MASTER MODE AND SLAVE MODE OF COMPUTING DEVICE**

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G06F 13/364	(2006.01)
G06F 13/40	(2006.01)

(52) **U.S. Cl.**

CPC ***G06F 1/1632*** (2013.01); ***G06F 13/364*** (2013.01); ***G06F 13/4081*** (2013.01)

(58) **Field of Classification Search**

CPC G06F 1/1632; G06F 1/1654; G06F 3/1438
USPC 710/110, 300–304, 316–317
See application file for complete search history.

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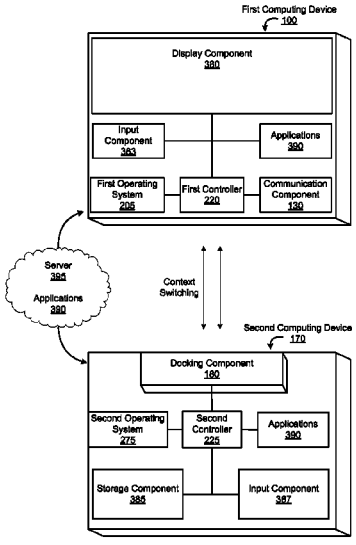
(57) **ABSTRACT**

A computing device to couple with a second computing device. The computing device switches between a master mode and a slave mode based on whether the computing device is docked with the second computing device.

20 Claims, 4 Drawing Sheets



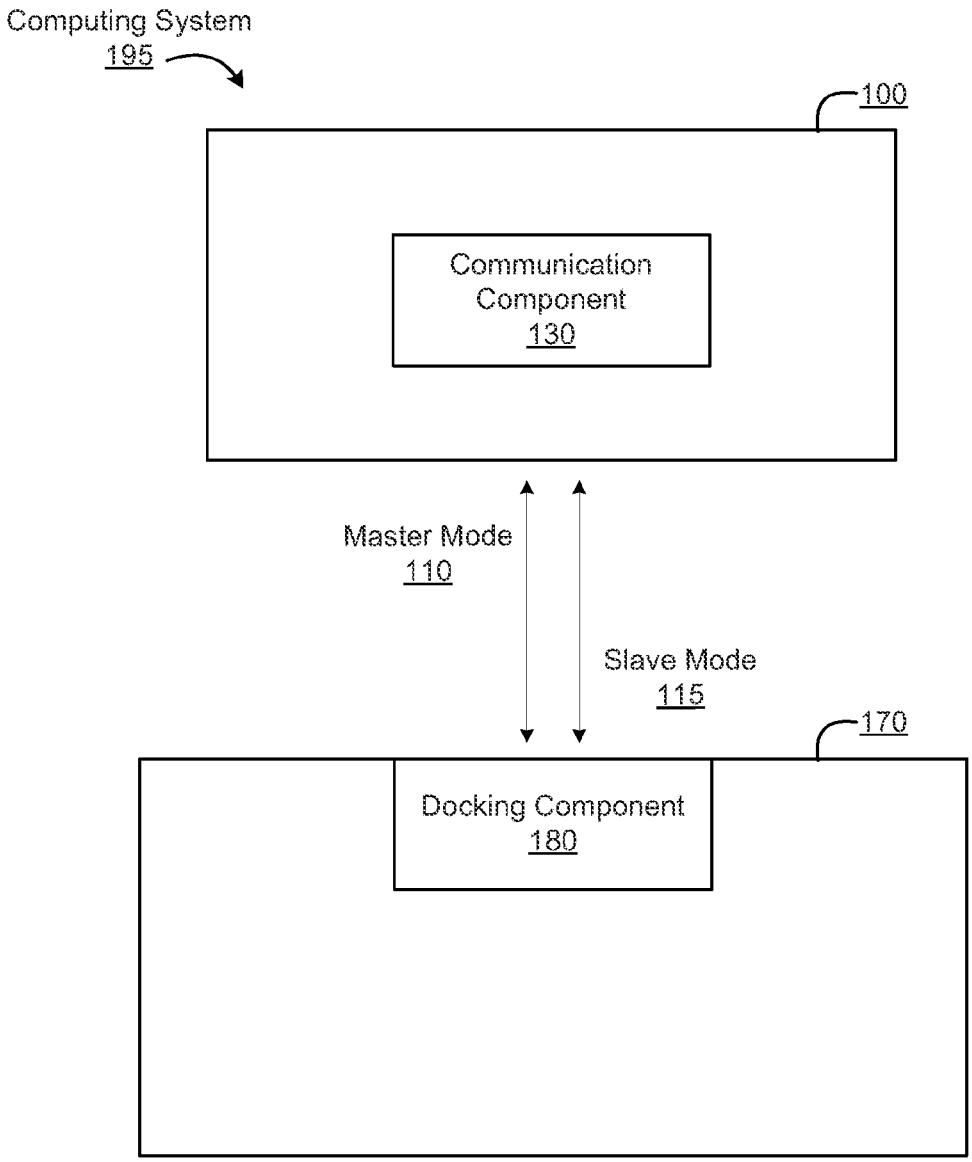

Computing System
195
100
Communication
Component
130
Master Mode
110
Slave Mode
115
170
Docking Component
180

Fig. 1

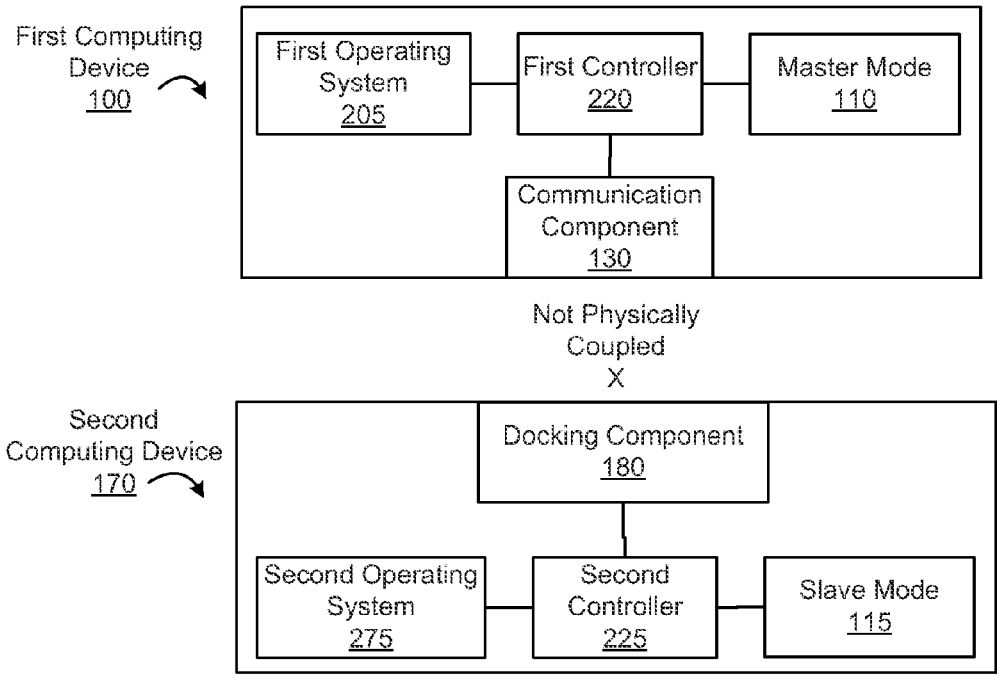

First Computing Device 100
First Operating System 205
First Controller 220
Master Mode 110
Communication Component 130
Not Physically Coupled
X
Second Computing Device 170
Docking Component 180
Second Operating System 275
Second Controller 225
Slave Mode 115

Fig. 2A

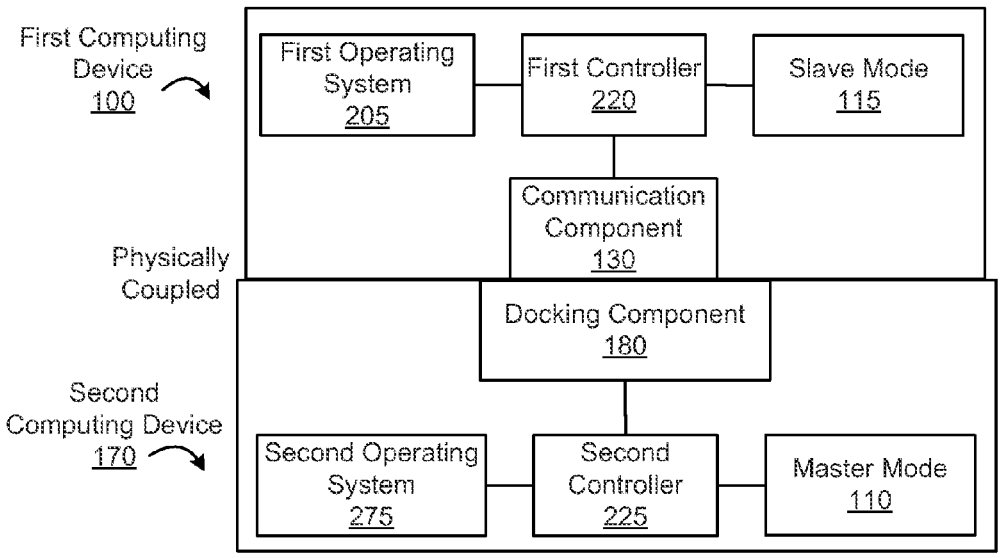

First Computing Device 100
First Operating System 205
First Controller 220
Slave Mode 115
Communication Component 130
Physically Coupled
Docking Component 180
Second Computing Device 170
Second Operating System 275
Second Controller 225
Master Mode 110

Fig. 2B

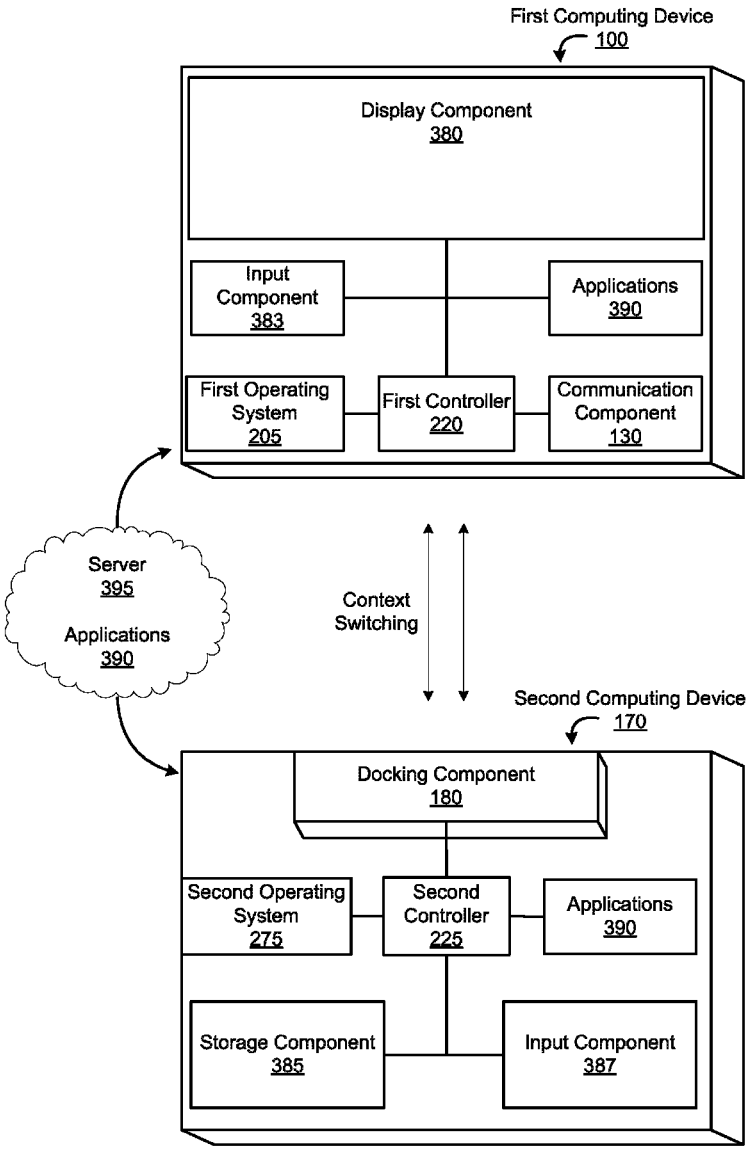

First Computing Device
100
Display Component
380
Input Component
383
Applications
390
First Operating System
205
First Controller
220
Communication Component
130
Server
395
Applications
390
Context Switching
Second Computing Device
170
Docking Component
180
Second Operating System
275
Second Controller
225
Applications
390
Storage Component
385
Input Component
387

Fig. 3

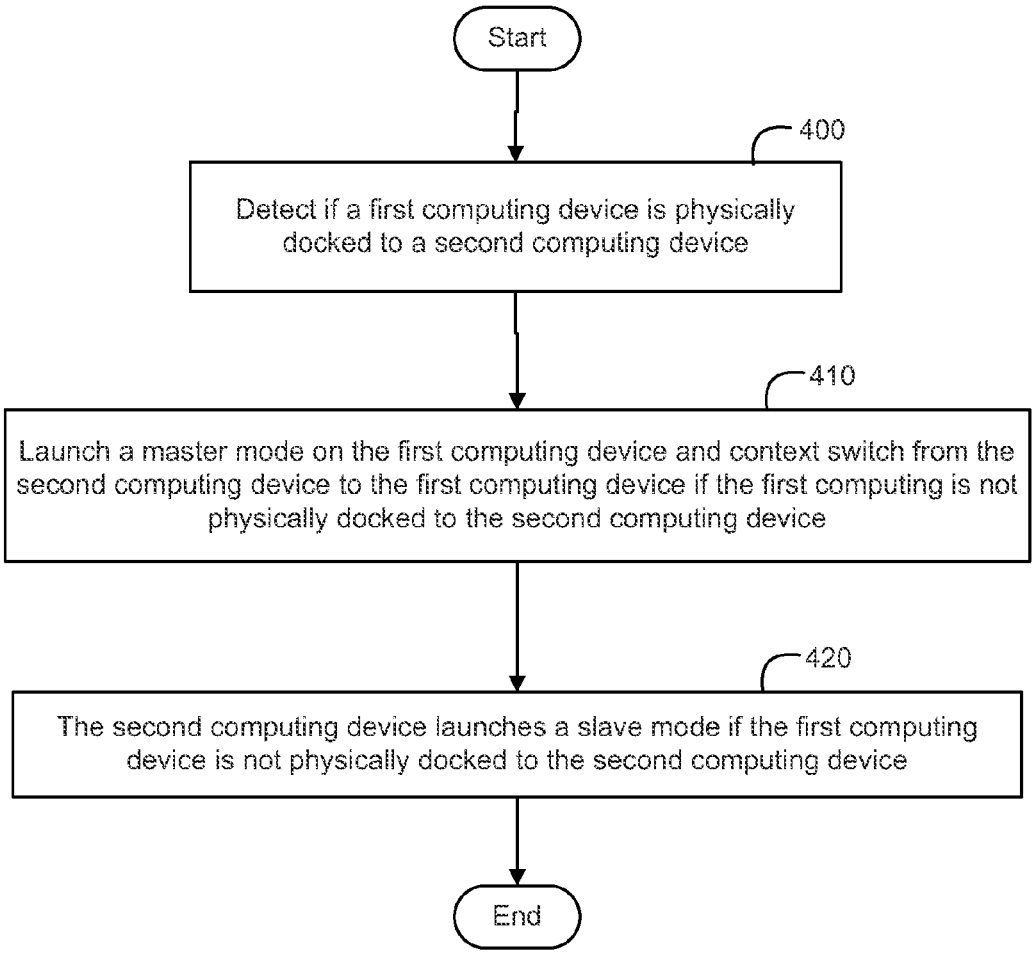

Start
400
Detect if a first computing device is physically docked to a second computing device
410
Launch a master mode on the first computing device and context switch from the second computing device to the first computing device if the first computing is not physically docked to the second computing device
420
The second computing device launches a slave mode if the first computing device is not physically docked to the second computing device
End

Fig. 4

MASTER MODE AND SLAVE MODE OF COMPUTING DEVICE

BACKGROUND

When coupling a computing device with another device, such as a docking station, the computing device can couple and interface with the docking station. In response to interfacing with the docking station, the computing device can proceed to utilize one or more expansion and interface ports included on the docking station as ports of the computing device.

BRIEF DESCRIPTION OF THE DRAWINGS

In the accompanying drawings, like numerals refer to like components or blocks. The following detailed description references the drawings, wherein:

FIG. **1** illustrates a computing system including a first computing device to couple with a second computing device according to an example.

FIG. **2**A and FIG. **2**B illustrate a first computing device switching between a master mode and a slave mode according to examples.

FIG. **3** illustrates a first computing device and a second computing device switching context based on a mode of the first computing device and the second computing device according to an example.

FIG. **4** is a flow chart illustrating a method for switching between a master mode and a slave mode according to an example.

DETAILED DESCRIPTION

A computing system includes a first computing device, such as a tablet or slate, and a second computing device, such as a base or a docking station. The first computing device switches between a master mode and a slave mode based on whether the first computing device is physically docked to the second computing device. For the purposes of this application, the master mode is an operation mode for a computing device to maintain control of the computing device. In one implementation, when operating in the master mode, the computing device can further control and manage the other computing device operating in a slave mode. The slave mode is an operation mode for one of the computing devices to allow the other computing device, operating in master mode, to control and manage it.

If the first computing device launches the master mode, a first controller of the first computing device, such as a reduced instruction set computing (RISC) processor, can launch a first operating system of the first computing device for the first computing device to operate as a tablet computing device. In one implementation, the second computing device also launches a slave mode for the second computing device to be controlled by the RISC processor and the first operating system.

In another implementation, if the first computing device launches the slave mode, the second computing device proceeds to launch the master mode. A second controller of the second computing device, such as a complex instruction set computing (CISC) processor, launches a second operating system to control and manage both the first computing device and the second computing device. The first computing device and the second computing device operate together as a notebook computing device. In one implementation, the CISC processor and/or the second operating system can include more features and/or functionality than the RISC processor and the first operating system.

For the purposes of this application, the first computing device is physically docked to the second computing device if a docking component of the second computing physically and electrically couples the first computing device to the second computing device. If the first computing device is not physically docked with the second computing device, the first computing device launches the master mode. The second computing device can also launch the slave mode. If the first computing device is physically docked with the second computing device, the first computing device launches the slave mode and the second computing device launches the master mode.

As the first computing device switches between the master mode and slave mode, context is switched to the computing device operating in master mode. For the purposes of this application, context switching includes transferring control of an application from a computing device operating in slave mode to the other computing device operating in master mode. An application can be a document application, a web browser, a media application, a game application, a system management application, a security application, and/or any additional application accessible to either computing device. In one implementation, the computing device operating in master mode also receives a state of the application and/or a file used by the application.

FIG. **1** illustrates a computing system **195** including a first computing device **100** to couple with a second computing device **170** according to an example. The computing system **195** includes a first computing device **100** which can physically dock with a second computing device **170**. For the purposes of this application, the first computing device **100** is physically docked with the second computing device **170** if the first computing device **100** is physically and electrically coupled to a docking component **180** of the second computing device **170**. Based on whether the first computing device **100** is physically docked with the second computing device **170**, the first computing device **100** switches between a master mode **110** and a slave mode **115**.

If the first computing device **100** is not physically coupled to the docking component **180**, the first computing device **100** launches the master mode **110**. In one implementation, the second computing device **170** also launches the slave mode **115**. Otherwise, if the first computing device **100** is physically coupled to the docking component **180**, the first computing device **100** launches the slave mode **115** and the second computing device **170** launches the master mode **110**. The master mode **110** is an operation mode for a computing device to maintain control of the computing device. The computing device operating in the master mode **110** can further control and manage the other computing device operating in slave mode **115**. The slave mode **115** is an operation mode for a computing device to allow the other computing device, operating in master mode **110**, to control and manage it.

The first computing device **100** can be a tablet, a slate, an a in-one system, a smart phone, a PDA (Personal Digital Assistant), an E (Electronic)-Reader, and/or any additional portable computing device to couple with a second computing device **170**. The first computing device **100** includes a communication component **130**, such as a Bluetooth component, a near field communication component, an infrared component, and/or a wireless radio, to wirelessly communicate with the second computing device **170** if the first computing device **100** is not physically docked with the second computing device **100**.

The first computing device **100** can also include a first controller and/or a first operating system. The first controller can be a reduced instruction set computing (RISC) processor and the first operating system can be a RISC operating system. In one example, if the first computing device **100** is operating in the master mode **110**, the first controller and/or the first operating system control the first computing device **100** as a tablet computing device. In another implementation, the first computing device **100** further includes a display component and an input component, such as a touch sensor, a touch screen, and/or an image capture component.

A second computing device **170** can be a base, a docking station, and/or any additional device to physically couple with the first computing device **100**. The second computing device **170** includes a docking component **130** to physically and electrically couple the first computing device **100** to the second computing device **170**. In one implementation, the second computing device **170** further includes a second controller and/or a second operating system for the second computing device **170** to operate in the master mode **110**.

The second controller can be a complex instruction set computing (CISC) processor and the second operating system can be a CISC operating system. In one example, if the second computing device **170** is operating in the master mode **105**, the CISC processor and the CISC operating system control both the first computing device **100** and the second computing device **170** for the computing devices to operate together as a notebook computing device. The CISC processor and/or the CISC operating system can include additional or more complex instructions and functions than the RISC processor and/or the RISC operating system.

In one implementation, when a computing device launches the master mode **110** and the other computing device launches the slave mode **115**, context is switched from the slave mode **115** computing device to the master mode **110** computing device. For the purposes of this application, context switching includes transferring control of one or more applications from the slave mode **115** computing device to the master mode **110** computing device. An application includes software and/or instructions executed on the slave mode **115** computing device operating. For example, the application can be a document application, a web browser, a media application, a game application, a system management application, and/or a security application. In one implementation, context switching includes the master mode **110** computing device receiving a state of an application and/or a file used by the application.

FIG. **2**A and FIG. **2**B illustrate a first computing device **100** switching between a master mode **110** and a slave mode **115** according to examples. As noted above, the first computing device **100** switches between the master mode **110** and the slave mode **115** based on whether the first computing device **100** is physically docked with a docking component **180** of the second computing device **170**. In one implementation, the second computing device **170** also switches between the master mode **110** and the slave mode **115** based on whether the first computing device **100** is physically docked with a docking component **180**. If the first computing device **100** launches a master mode **110**, the second computing device **170** can launch a slave mode **115** and vice versa.

For the purposes of this application, the docking component **180** is a hardware component which physically and electrically couples the first computing device **100** to the second computing device **170**. The docking component **180** can include a mounting component, such as a latch, hook, and/or magnet, to secure the first computing device **100** to the second computing device **170**. The docking component **180** also includes electrical components for the first computing device **100** to electrically couple and interface with the second computing device **170**.

The first computing device **100** can also include an interface component (not shown) to couple with the docking component **180** and interface the first computing device **100** with the second computing device **170**. The interface component notifies a first controller **220** of the first computing device **100** if the interface component is coupled to the docking component **180** of the second computing device **170**. Similarly, the docking component **180** notifies a second controller **225** of the second computing device **170** if the docking component **180** is coupled to the interface of the first computing device **100**. The notification can be provided to the first controller **220** and the second controller **225** as one or more signals.

If the interface component does not provide notification that that the first computing device **100** is physically docked with the docking component **180**, the first controller **220** launches a master mode **110** on the first computing device **100**. The first controller **220** can be a processor, such as a reduced instruction set computing (RISC) processor. The RISC processor can be a semiconductor-based microprocessor, or any other device suitable for retrieval and execution of instructions. In one implementation, the first controller **220** includes logic instead of or in addition to a processor. As an alternative or in addition to fetching, decoding, and executing instructions, the first controller **220** may include one or more integrated circuits (ICs) or other electronic circuits that comprise a plurality of electronic components for performing the functionality described below.

The first controller **220** further launches a first operating system **205** in response to launching the master mode **110**. The first operating system **205** is a reduced instruction set computing (RISC) operating system and includes software and/or firmware to be used independently and/or in conjunction with the first controller **220** to control the first computing device **100**. When the first computing device **100** is operating in the master mode **110**, the first controller **220** and/or the first operating system **205** control the first computing device **100**.

In one implementation, if the first computing device **100** launches the master mode **110**, a second controller **225** of the second computing device **170** launches a slave mode **115**. Similar to the first controller **220**, the second controller **225** can be a processor, such as a complex instruction set computing (CISC) processor. If the second computing device **170** is in the slave mode **115**, the second controller **225** can disable, suspend, or not launch a second operating system **275** of the second computing device **170**. By disabling, suspending or not launching the second cooperating system **275**, the first controller **220** and/or the first operating system **205** can control and manage both the first computing device **100** and the second computing device **170**.

If the first computing device **100** launches the master mode **110** and the second computing device **170** launches the slave mode **115**, the first computing device **100** can operate as a tablet computing device and the second computing device **170** can operate as a receiver. The first controller **220** and/or the first operating system **205** enable a communication component **130** of the first computing device **100** to wirelessly communicate with the second computing device **170**. The communication component **130** is a hardware component, such as a Bluetooth component, a near field communication component, an infrared and/or a wireless radio for the first computing device **100** to wirelessly transmit instructions and communicate with the second computing device **170**.

In another example, as illustrated in FIG. **2**B, the first computing device **100** is physically docked with the docking

component **180**. The interface component can provide notification that that the first computing device **100** is physically docked with the docking component **180** and the first controller **220** launches a slave mode **115**. When operating in the slave mode **115**, the first computing device **100** acts as a secondary or slave device to receive commands or instructions from the second controller **225** and/or the second operating system **275**. If the first computing device **100** is in the slave mode **115**, the first controller **220** can further disables, suspend, and/or not launch the first operating system **205** of the first computing device **100**.

The docking component **180** of the second computing device **170** can also provide a notification that the docking component **180** is coupled to the interface component. The second controller **225** can then launches a master mode **110** on the second computing device **170**. The second controller **225** can further launch the second operating system **275** to be used independently and/or in conjunction with the second controller **225** to control and manage the first computing device **100**. The second operating system **275** is a complex instruction set computing (CISC) operating system which includes software and/or firmware to be used independently and/or in conjunction with the second controller **225** to control and manage both the first computing device **100** and the second computing device **170**. In response to the first computing device **100** and the second computing device **170** switching between the master mode **110** and the slave mode **115**, context is switched between the first computing device **100** and the second computing device **170**.

FIG. **3** illustrates a first computing device **100** and a second computing device **170** context switching based on a mode of the first computing device **100** and the second computing device **170** according to an example. For the purposes of this application, context switching includes the computing device operating in the master mode (master mode computing device) receiving control of applications **390** and a state of the applications **390** from the computing device operating in the slave mode (slave mode computing device). Receiving control and a state of the applications **390** can include the first computing device **100** and the second computing device **170** synchronizing applications **390** with one another or with a server **395** coupled to both of the computing devices.

The first computing device **100** can use the communication component **130** for communicating and synchronizing applications **390** with the second computing device **170** and/or the server **395**. The second computing device **170** can also include a second communication component (not shown) for communicating and synchronizing applications **390** with the first computing device **100** and/or the server **395**. Similar to the communication component **130**, the second communication component is a hardware component, such as a Bluetooth component, a near field communication component, an infrared and/or a wireless radio for second first computing device **170** to communicate with the first computing device **100** and/or the server **395**.

In one example, synchronizing the applications **390** can include the slave mode computing device transferring to the master mode computing device, applications **390** which are loaded onto a memory of the slave mode computing device. In another implementation, the slave mode computing device transfers the applications **390** to the server **395**. The server **395** provides the master mode computing device the applications **390** when the computing device launches the master mode or in response to a request from the master mode computing device. The server **395** acts as a repository for the two computing devices to synchronize applications **390** as they switch between master and slave mode.

In one example, the second computing device **170** can include Application 1, Application 2, and Application 3 loaded onto the memory. If the second computing device **170** launches the slave mode and the first computing device **100** launches the master mode, Application 1, Application 2, and Application 3 are transferred from the memory of the second computing device **170** to the first computing device **100** or to the server **395**, Application 1, Application 2, and Application 3 are then loaded onto a memory of the first computing device **100**. In another example, if the first computing device **100** subsequently launches the slave mode and the second computing device **170** launches the master mode; Application 1, Application 2, and Application 3 can be transferred from the memory of the first computing device **100** to the second computing device **170** or to the server **395**.

In one implementation, the first computing device **100** and the second computing device **170** can further synchronize a state of the applications **390** and files used by the applications **390**. The state of an application **390** can identify whether the corresponding application **390** is open, settings of the corresponding application **390**, and/or identify files being accessed by the application **390**. In other implementations, the state of an application **390** can identify other additional information of the corresponding application in addition to and/or in lieu of those noted above. A file used by the application **390** can include one or more files currently, previously, and/or anticipated to be used or accessed by the corresponding application. In one example, the file can be a media file, a document, and/or webpage.

Synchronizing the state of the application **390** and the files can include the slave mode computing device saving a state of the application **390** and identifying files used by the application **390**. The slave mode computing device can save the state of the application **390** in response to the computing device launching the slave mode. The state of the application **390** and the files are transferred to the master mode computing device or to the server **395**. The state of the application **390** can be transmitted as a file or as metadata associated with the application **390**. In another implementation, the state of the application **390** and the file can be transferred to the server **395** for the server **395** to provide to the master mode computing device.

In another implementation, context switching can also include the slave mode computing device sharing components and resources with the master mode computing device. As illustrated in FIG. **3**, the first computing device **100** can further include a display component **380**, an input component **383**, and a communication component **130**. The second computing device **170** can further include a storage component **385** and an input component **387**.

For example, if the first computing device **100** launches the master mode and the second computing device **170** launches the slave mode, the first computing device **100** operates at a tablet computing device and the storage component **385** of the second computing device can be used by the first computing device **100** as an external storage component to stream content through the communication component **130** of the first computing device **100**.

In another example, if the first computing device **100** is operating in the slave mode and the second computing device **170** is operating in the master mode, the first computing device **100** and the second computing device **170** operate together as a notebook computing device and the display component **380**, the input component **383**, and the communication component **130** of the first computing device **100** operate as a display, an input, and a communication components of the second computing device **170**.

FIG. **4** is a flow chart illustrating a method for switching between a master mode and a slave mode according to an example. The first controller of the first computing device initially detects if the first computing device is physically docked to a second computing device at **400**. If the first computing device is not physically docked to the second computing device, the first controller launches a master mode on the first computing device and context is switched from the second computing device to the first computing device at **410**. If the first computing device is operating in the master mode, a second controller of the second computing device can launch a slave mode at **420**. In response to the first computing device launching the master mode and the second computing device operating in the slave mode, a first operating system of the first computing device is enabled and a second operating system of the second computing device can be disabled or is not launched.

In another embodiment, if the first computing device is physically docked to the second computing device, the first controller launches a slave mode on the first computing device and switches context from the first computing device to the second computing device. The second controller also launches a master mode for the second computing device and enables the second operating system of the second computing device. The first operating system of the first computing device is disabled or is not launched. The method is then complete. In other embodiments, the method of FIG. **4** includes additional steps in addition to and/or in lieu of those depicted in FIG. **4**.

What is claimed is:

1. A computing system comprising:

a first computing device with a communication component to wirelessly communicate with a second computing device;

wherein the second computing device includes a docking component to dock with the first computing device as a base;

wherein the first computing device and the second computing device each include an interface component that couples with the docking component, wherein each of the interface components interfaces the first computing device with the second computing device and provides notification when docked;

wherein the first computing device and the second computing device switch between a master mode and a slave mode based on whether the first computing device is docked with the second computing device, wherein the switch includes synchronization of a state of an application and identification of a file used by the application;

wherein the first computing device includes a reduced instruction set computing processor and a first operating system and the second computing device includes a complex instruction set computing processor; and

wherein the first operating system associated with the first computing device is disabled when docked with the second computing device.

2. The computing system of claim **1** wherein the first computing device operates in the master mode and the second computing device operates in the slave mode when the first computing device is not docked with the second computing device.

3. The computing system of claim **1** wherein the first computing device operates in the slave mode and the second computing device operates in the master mode when the first computing device is docked with the second computing device.

4. The computing system of claim **1** wherein the second computing device includes a second operating system.

5. The computing system of claim **4** wherein the second operating system is enabled when the first computing device is docked with the second computing device.

6. The computing system of claim **3**, wherein the first computing device entering the slave mode switches context of the application to the second computing device entering the master mode.

7. The computing system of claim **6** wherein the second computing device entering the master mode receives at least one of a state of the application and a file used by the application from the first computing device entering the slave mode or a server hosting the application.

8. A method for switching between a master mode and a slave mode comprising:

detecting a first computing device is physically docked to a second computing device wherein the first computing device includes a reduced instruction set computing processor and the second computing device includes a complex instruction set computing processor, wherein the first computing device and the second computing device each include an interface component that couples with the docking component, wherein each of the interface components interfaces the first computing device with the second computing device and provides notification when docked;

launching a master mode on the first computing device and context switching from the second computing device to the first computing device when the first computing device is not physically docked to the second computing device, wherein the context switching includes synchronization of a state of an application and identification of a file used by the application; and

wherein the second computing device launches a slave mode and includes context switching of the application to the first computing device entering the master mode when the first computing device is not physically docked to the second computing device.

9. The method for switching between a master mode and a slave mode of claim **8** wherein a first operating system of the first computing device is enabled and a second operating system of the second computing device is disabled when the first computing device launches the master mode.

10. The method for switching between a master mode and a slave mode of claim **8** further comprising launching a slave mode on the first computing device and context switching from the first computing device to the second computing device when the first computing device is physically docked to the second computing device.

11. The method for switching between a master mode and a slave mode of claim **8** wherein context switching includes the first computing device and the second computing device synchronizing at least one of an application, a state of the application, and a file used by the application.

12. The method for switching between a master mode and a slave mode of claim **10** wherein the second computing device launches the master mode when the first computing device is physically docked to the second computing device.

13. The method for switching between a master mode and a slave mode of claim **12** wherein a second operating system of the second computing device is enabled and a first operating system of the first computing device is disabled when the second computing device launches the master mode.

14. The method for switching between a master mode and a slave mode of claim **11** wherein the first computing device

and the second computing device synchronize the application, the state of the application, and the file used by the application with one another.

15. The method for switching between a master mode and a slave mode of claim **11** wherein the first computing device and the second computing device synchronize the application, the state of the application, and the filed used by the application with a server.

16. A computing device to couple with a second computing device comprising:

a communication component to communicate with the second computing device when the first computing device is not docked with the second computing device;

wherein the first computing device and the second device each include an interface component to interface the first computing device with the second computing device and to notify the second computing device of the docked first computing device, wherein the second computing device controls the first computing device when the first computing device is docked with the second computing device;

a controller to switch the first computing device between a master mode and a slave mode for context switching based on whether the first computing device is docked with the second computing device, wherein the context switching includes synchronization of a state of an application and identification of a file used by the application, wherein the first computing device includes a reduced instruction set computing processor and a first operating system, wherein the second computing device includes a complex instruction set computing processor, and wherein the first operating system is disabled when docked with the second computing device; and

wherein the second computing device launches the slave mode and switches context of the application to the first computing device entering the master mode when the first computing device is not physically docked to the second computing device.

17. The computing device to couple with a second computing device of claim **16** wherein the second computing device operates in the slave mode and as a storage component for the computing device when the computing device is not docked with the second computing device.

18. The computing device to couple with a second computing device of claim **16** wherein the communication component includes at least one a near field communication component, a Bluetooth component, an infrared component, and a wireless radio component.

19. The computing device to couple with a second computing device of claim **16** wherein the computing device is a portable computing device which includes a display component and an input component.

20. The computing device to couple with a second computing device of claim **19** wherein components of the portable computing device operate as a display component, an input component, and a wireless communication component for the second computing device when the computing device is docked with the second computing device.

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